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OF NY & NJ**

**CONFORMED DRAWING**  
02/03/98  
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THE OFFICE OF  
**DND  
ELIOT  
LEBOWITZ**

CONTRACT NO. 100-97-001  
100-97-001-001-001-001

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ISSUED FORUM

No. Date Revision Approved

Engineering Department

Design Divisions

**The World  
Trade  
Center**

**STANDBY POWER  
5 WORLD TRADE CENTER**

**STRUCTURAL**

**GENERAL NOTES**

The drawings subject to conditions in contract  
agreements, specifications, and methods  
of construction, and to the Port Authority and  
may not be used without the prior consent.

WTS CM RT  
Designed by Drawn by Checked by

Date 1/11/98

Contract Number Drawing Number

WTC-945.071 80-04

**II. ERECTION**

1. SURVEYS: CONTRACTOR SHALL EMPLOY A REGISTERED PROFESSIONAL ENGINEER OR PROFESSIONAL SURVEYOR EXPERIENCED IN SURVEYING STEEL BUILDING FRAMEWORKS. CONTRACTOR SHALL ORGANIZE SURVEYING, FIELD SURVEYING PROCEDURES AND RECORDS TO DEMONSTRATE THE DEGREE OF CONFORMANCE OF THE STEELWORK TO TOLERANCES APPLICABLE TO PLATE, LEVEL, HORIZONTAL ALIGNMENT AND VERTICAL ALIGNMENT. DISCREPANCIES FROM THEORETICAL ELEVATION: CONTRACTOR SHALL REPORT ALL DISCREPANCIES. CONTRACTOR SHALL NOT PROCEED WITH EACH ERECTION STEP UNTIL APPROPRIATE ACCEPTABLE CORRECTIONS HAVE BEEN MADE, OR UNTIL COMPENSATING ADJUSTMENTS TO THE STRUCTURAL STEELWORK HAVE BEEN ACCEPTED. CONTRACTOR'S SURVEYS FOR STEELWORK SHALL:

- ESTABLISH PERMANENT BENCH MARKS AS SHOWN AND AS NECESSARY FOR THE ACCURATE ERECTION OF STRUCTURAL STEEL;
- ASSURE THAT ELEVATIONS OF BEARING SURFACES, AND LOCATIONS OF ANCHOR DEVICES ARE CHECKED BY ACCURATE SURVEYING BEFORE ERECTION WORK PROCEEDS; AND
- PROVIDE SURVEY DATA DURING THE COURSE OF THE WORK AND A FINAL SURVEY SHOWING THE E-M, V-S AND ELEVATION POSITION OF THE WORK POINTS OF EACH STEEL FRAME, COLUMN AND OTHER MAJOR MEMBER AS COMPARED TO THEORETICAL LOCATION.

3. TAKE SURVEYS AND MEASURE TOLERANCES AND DIMENSIONS AT 68°F (20°C) OR SHOW CORRECTIONS TO SURVEY WHERE TEMPERATURE IS EITHER HIGHER OR LOWER.

2. ANCHOR BOLTS AND OTHER CONNECTIONS: FURNISH ANCHOR BOLTS, EMBEDDED PLATES AND OTHER CONNECTION MATERIALS WHICH MUST BE EMBEDDED INTO CONCRETE WORK. DELIVER TO THE CONSTRUCTION SITE ON-TIME AND COMPLETE WITH TEMPLATES AND PLACING DRAWINGS. TIGHTEN NUTS IN A MANNER CONSISTENT WITH THE INTENT AND METALLURGY OF THE BOLT MATERIAL.

a) UNLESS OTHERWISE PROVIDED, FOR BOLTS DESIGNATED AS A325, A490 OR DYNAMIC THREADBARS, TIGHTEN 1/4 TURN PAST SNUG TIGHT.

3. BASE PLATES, AND BEARING PLATES: FURNISH AND PLACE BASE PLATES AND BEARING PLATES ACCURATELY, SECURELY SHIM, SURVEY, AND ALIGN. BE RESPONSIBLE FOR MAINTAINING STEEL IN PROPER POSITION THROUGH COMPLETION OF GROUTING AND UNTIL GROUT HAS ACHIEVED FULL STRENGTH. DO NOT ALLOW GROUTING UNTIL BEAMS, COLUMNS AND 20 FOOT ARE PERMANENTLY ATTACHED TO COLUMN.

4. GUYING AND BRACING: THE STRUCTURAL SYSTEM MAY REQUIRE TEMPORARY BRACING IN ADDITION TO MEMBERS SHOWN IN THE CONTRACT DRAWINGS IN ORDER TO RESIST SAID ALL APPLIED LOADS DURING CONSTRUCTION AND TO MAINTAIN CORRECT ALIGNMENT. PROVIDE TEMPORARY GUYING, BRACING AND CONNECTIONS WHERE NEEDED TO RESIST ALL POSSIBLE COMBINATIONS OF CONSTRUCTION AND ERECTION LOADS INCLUDING DEAD LOADS, ERECTION LOADS, WIND AND OTHER LATERAL LOADS AND SUPERIMPOSED CONSTRUCTION LOADS WITH HORIZONTAL AND VERTICAL. REMOVE TEMPORARY MEMBERS AND CONNECTIONS AFTER PERMANENT MEMBERS ARE IN PLACE. FINAL CONNECTIONS ARE MADE AND CONCRETE HAS ACHIEVED DESIGN STRENGTH.

5. BOLT TENSIONING: ASTM A325 AND A490 BOLTS SHALL BE INSTALLED USING ONE OF THE FOLLOWING SYSTEMS:

a) TENSION CONTROLLED FASTENERS WITH SPUNNED TWIST-OFF NUTS (TCF) SHALL BE INSTALLED IN ACCORD WITH AISC SPECIFICATION REQUIREMENTS AND WITH APPLICABLE PRINTED INSTRUCTIONS AND RECOMMENDATIONS PROVIDED BY THE FASTENER MANUFACTURER AND TENSIONING SYSTEM SUPPLIER. TO PROVIDE UNIFORM AND FULL TENSIONING IN MULTI-BOLT JOINTS, BOLTS SHALL BE TIGHTENED IN STAGES TO ASSURE UNIFORM CONTACT BETWEEN FASTENING SURFACES AND SNUG-TIGHT CONDITION AT ALL POINTS WITHIN EACH JOINT PRIOR TO FINAL TENSIONING AND SHEARING OF THE SPLINE.

1) CONTRACTOR SHALL CHECK EACH TCF BOLT AFTER TENSIONING TO VERIFY THAT THE SHEARED SURFACE DOES NOT DISPLAY ANY ABNORMALITY. BOLTS DISPLAYING AN ABNORMALITY SHALL BE REMOVED AND REPLACED.

b) BOLTS ONE INCH (25 MM) IN DIAMETER AND LARGER AND ALL ASTM A490 BOLTS SHALL BE TENSIONED BY DIRECT-TENSION INDICATING WASHERS (DTI) IN STRICT ACCORD WITH ASTM F959. UNDER NO CIRCUMSTANCE MAY A DTI BE REUSED. DTI WASHERS SHALL NOT BE USED DIRECTLY OVER SLOTTED OR OVERSIZED HOLES BUT SHALL BE USED IN ADDITION TO ALL SPECIAL WASHERS REQUIRED AT SLOTTED OR OVERSIZED HOLES. TENSIONING METHOD, NUMBER, THICKNESS AND TYPE OF WASHERS, PROCEDURE AND REQUIREMENTS SHALL BE IN STRICT ACCORD WITH THE MANUFACTURER'S LATEST PRINTED INSTRUCTIONS AND RECOMMENDATIONS.

1) CONTRACTOR SHALL VERIFY CORRECT TENSION BY MEASURING THE AVERAGE RESIDUAL GAP BETWEEN THE BOLT HEAD OR NUT AND THE DTI IN STRICT ACCORD WITH ASTM F959. TORQUE WRENCHES OR CALIBRATED WRENCHES SHALL NOT BE USED TO INSPECT OR TO VERIFY THE TENSION.

1) FOR BOLTS EXPOSED TO THE WEATHER, GAPS IN TYPE 115 DTI SHALL BE REWORKED TO LESS THAN 1/16 INCHES (1.30 MM) FOR NOT LESS THAN HALF OF THE PERIMETER OF THE DTI. PROVIDE ADDITIONAL GAP REWORK WHERE REQUIRED TO MAINTAIN AVERAGE GAP.

c) FILLER BEAMS MAY, AT CONTRACTOR'S OPTION, BE CONNECTED WITHOUT MAKING USE OF A TENSION CONTROL DEVICE BUT, IF SO, SHALL BE TENSIONED BY THE TURN-OF-THE-NUT METHOD. FILLER BEAMS DO NOT FRAME TO, OR FRAME IMMEDIATELY ADJACENT TO, COLUMNS, DO NOT FRAME TO GIRDERS CARRYING LOADS, POSTS OR HANGERS (EXCEPT STAIR LANDING HANGERS), AND DO NOT FRAME TO TRUSSES.

d) EXCEPT WHERE SPECIFICALLY WAIVED IN THE STRUCTURAL DRAWINGS, ALL A325 AND A490 BOLTS, WHETHER OR NOT USED IN BEARING-TYPE CONNECTIONS, SHALL BE FULLY TENSIONED. THIS REQUIREMENT SHALL BE MAINTAINED WHETHER OR NOT REQUIRED BY AISC SPECIFICATION.

6. BOLTING REQUIREMENTS: CONTRACTOR SHALL PAY STRICT ATTENTION TO THE APPLICABLE CODES AND STANDARDS TO THE REQUIREMENTS OF THIS SPECIFICATION AND TO THE FOLLOWING GENERAL REQUIREMENTS:

a) IMPACT WRENCHES USED FOR TIGHTENING ASTM A325 AND ASTM A490 BOLTS SHALL BE IN SUFFICIENTLY GOOD REPAIR TO DEPENDABLY DELIVER THE MANUFACTURER'S FULL RATED TORQUE. AIR COMPRESSION (S) USED TO POWER IMPACT WRENCHES SHALL BE IN GOOD REPAIR AND SHALL BE CAPABLE OF DELIVERING ADEQUATE AIR PRESSURE AND VOLUME SO THAT FULL RATED PERFORMANCE IS ACHIEVED FROM EACH WRENCH AT THE POINT OF BOLTING. AIR HOSES AND COUPLINGS SHALL BE KEPT CLEAN. THE IMPACT WRENCHES SELECTED SHALL TIGHTEN THE BOLTS TO NOT LESS THAN THE HIGHEST SPECIFIED TENSION IN TEN SECONDS OR LESS.

1) FOR BOLT SIZES EQUAL TO OR LARGER THAN 1 IN. (25 MM) A325 AND 7/8 IN. (22 MM) A490, PROVIDE IMPACT WRENCHES EQUIVALENT TO OR LARGER IN CAPACITY THAN A CHICAGO PNEUMATIC 6120, WITH AIR PRESSURE AT THE WRENCH NOT LESS THAN 100 PSI (700 KPA).

b) WASHERS: A HARDENED WASHER SHALL BE INSTALLED ADJACENT TO THE BEARING FACE OF THE TURNED ELEMENT BOLT OR BOLT HEAD OF EACH ASTM A325 OR ASTM A490 BOLT ASSEMBLY. A 5/16 INCH (8 MM) THICK WASHER OR THICKER, OTHERWISE CONFORMING TO ASTM F436, SHALL BE USED AT BOTH ENDS OF 1-1/8 IN (28 MM) DIAM. AND 1-1/4 IN (32 MM) DIAM. A490 BOLTS WHERE MATERIAL IS 5/8 INCH (16 MM) OR LESS IN THICKNESS.

c) LONG SLOTTED HOLES, WHERE ACCEPTED, AND WHERE ON AN OUTSIDE PLY, SHALL BE COVERED COMPLETELY BY 3/16 INCH (4 MM) HARDENED (SHEAR); ALTERNATIVELY, EITHER PLATE WASHERS OR CONTINUOUS BARS OF AT LEAST 1/4 INCH (10 MM) THICKNESS AND MINIMUM YIELD POINT OF  $F_y = 50$  KSI (345 N/A) MAY BE USED. HOLES IN PLATE WASHERS OR BARS SHALL BE STANDARD SIZE. REGULAR HARDENED WASHERS ARE REQUIRED IN ADDITION TO PLATE WASHERS OR BARS.

d) SHORT SLOTTED AND OVERSIZED HOLES, WHERE ACCEPTED, AND WHERE ON AN OUTSIDE PLY, SHALL BE COVERED BY HARDENED WASHERS, PLATE WASHERS OR CONTINUOUS BARS AS PROVIDED FOR LONG SLOTTED HOLES.

e) BOLTS AND NUTS, AT TIME OF TIGHTENING, SHALL BE CLEAN, RUST-FREE, FREE FROM DIRT, DANGERS, AND SHALL RETAIN NOT LESS THAN THE LIGHT RESIDUAL COATING OF OIL AS RECEIVED FROM THE FACTORY. THREAD LUBRICANTS SHALL BE APPLIED TO ALL ASTM A490 BOLTS OR NUTS, TO ALL 1 IN. (25 MM) AND LARGER ASTM A325 BOLTS AND TO ALL BOLTS AND NUTS THAT DISPLAY ANY SIGN OF LOSS OF RESIDUAL OIL, RUST OR OTHER CONTAMINANT, WHERE GALVANIZED NUTS ARE NOT MAX-DIPPED BY MANUFACTURER. APPLY THREAD LUBRICANT.

1) LUBRICATION SHALL BE COMPLETED PRIOR TO ASSEMBLY AND PRIOR TO BOLTS BEING SENT UP INTO THE STEEL FRAME.

1) IN THE EVENT OF A DISPUTE REGARDING TIGHTNESS OF BOLTS INSTALLED IN THE FIELD, CLEARANCES AND LUBRICATION OF BOLTS AND NUTS USED FOR VERIFICATION TESTS SHALL BE SPECIFICALLY REPRESENTATIVE OF FIELD MATERIALS AND CONDITIONS.

2) TIGHTENING PROCEDURES: DURING TIGHTENING, TO THE FULL EXTENT PRACTICAL, THE TURNED BOLT ELEMENT SHALL BE HELD WITHOUT ROTATION. ALL PILES SHALL FIRST BE BROUGHT INTO FULL CONTACT BY PARTIALLY TENSIONING ALL OF THE BOLTS. TENSIONING SHALL PROCEED FROM THE END OF THE BOLT TO THE END OF THE CONNECTION, MOVING TO THE FREE ENDS.

g) RETIGHTENING: ASTM A490 BOLTS AND GALVANIZED ASTM A325 AND A490 BOLTS, ONCE COMPLETELY OR PARTIALLY TORQUED, SHALL NOT BE REUSED. ASTM A325 BOLTS MAY BE REUSED ONLY WITH SPECIFICALLY IDENTIFIED REPRESENTATIVE OF FIELD MATERIALS AND CONDITIONS.

h) LENGTH: BOLTS SHALL NOT PROJECT BEYOND THE FACE OF THE NUT BY MORE THAN 1/4 INCH (6 MM), SMALLER WHERE REQUIRED TO ACHIEVE CLEARANCE.

7. UNFILL HOLES SHALL NOT BE ENLARGED BY BURNING OR DRIFTING ALONG. ENLARGE HOLES WHERE NECESSARY AND PERMITTED BY PLANS PERFORMING AND BRACING OR BY BEARING ALONG OR BY OTHER ACCEPTED MEANS. UNFILL HOLES ENLARGEMENT SHALL BE TRUE ROUND HOLES NORMAL TO THE SURFACES JOINED. HOLE SIZE TO FILL ENLARGED AND REAMED HOLES.

8. SPLICES: COLUMN SPLICES AND OTHER COMPRESSION JOINTS THAT DEPEND UPON CONTACT BEARING AFTER ALIGNMENT SHALL CONFORM WITH THE FOLLOWING:

a) BEARING SURFACES SHALL BE CLEANED BEFORE THE PARTS ARE ASSEMBLED.

b) FASTENING OF COMPRESSION SPLICES AND JOINTS SHALL BE PERFORMED AFTER THE ADJUTING SURFACES HAVE BEEN BROUGHT INTO FULL CONTACT.

c) AN AREA OF NOT LESS THAN 65% OF THE CONTACT AREA SHALL BE IN UNIFORM BEARING.

1) CONTACT AREA IS THE GROSS AREA OF THE SMALLER PIERCE JOINED WITHOUT DEDUCT FOR WELD BEVELS AND THE LIKE.

1) AREA OF UNIFORM BEARING IS THAT PORTION OF THE CONTACT AREA WHICH IS SEPARATED BY NOT MORE THAN 0.02 INCHES (0.50 MM) FROM THE LARGER PIERCE JOINED. NOTE THAT THE TOTAL AREA OF SURFACE JOINED BY WELDING IS INCLUDED. AT CONTRACTOR'S OPTION, THE AREA OF UNIFORM BEARING MAY BE INCREASED TO CORRECT FIT-UP DEFICIENCIES BY EITHER:

- INCREASING THE WELD SURFACE AREA, OR
- PLACING WITH STAINLESS STEEL, 3/16 INCH (1.50 MM) OR THINNER IN THICKNESS.

d) THE AREA OF UNIFORM BEARING SHALL BE LOCATED SYMMETRICALLY ABOUT BOTH OF THE SYMMETRICAL AXES OF THE SMALLER PIERCE JOINED. TO ACHIEVE THIS REQUIREMENT, ANY PART OF THE AREA OF UNIFORM BEARING MAY BE REDUCED, PROVIDED THAT THE REMAINING AREA IS NOT LESS THAN 65% OF THE CONTACT AREA.

e) OUTSIDE OF THE AREA OF UNIFORM BEARING, SEPARATIONS GREATER THAN 0.03 INCHES (0.75 MM) SHALL BE CORRECTED BY SHIMMING.

9. FINER TIGHT: BOLTS DESIGNATED AS "FINER TIGHT" SHALL BE TIGHTENED TO 60 INCH-POUNDS (6 N-M) WITH THE GOALS OF BRACING THE PARTS FINELY TOGETHER WHILE ALLOWING FOR A SLIDING CONNECTION. PROVIDE DOUBLE NUTS AT ALL SUCH LOCATIONS. PROVIDE NOT LESS THAN TWO FULL CYCLES OF TIGHTENING AND UNTIGHTENING AT EACH SUCH LOCATION. PROPERLY TIGHTENED.

10. THING WHERE REQUIRED TO CORRECT FIT-UP OF WORK, SHALL BE OF STAINLESS STEEL.

11. RUNOFF AND RUNN TARS SHALL BE PROVIDED AT THE ENDS OF ALL SENSITIVE BUTT WELDS AND BOTH TABS AND ERECTION AIDS SHALL BE PROVIDED AT ALL LOCATIONS WHERE THEY INTERFERE WITH THE USE OF OTHER TRADES, AND AT ALL LOCATIONS DESIGNATED. RUNOFF TARS SHALL BE NOT LESS THAN 1-1/4 INCHES (30 MM) IN LENGTH.

12. DRILLED-IN ANCHORS SHALL BE INSTALLED IN STRICT ACCORD WITH MANUFACTURER'S PRINTED INSTRUCTION. SET PERPENDICULAR TO CONCRETE SURFACE. ANCHORS MAY BE PLACED IN BLOCK OR BRICK WORK ONLY WHERE Voids WITHIN 9 INCHES (230 MM) OF THE ANCHOR HAVE BEEN FILLED SOLIDLY WITH GROUT. DRILLED HOLES SHALL BE CLEANED THOROUGHLY BY COMPRESSED AIR OR WATER JET. HOLES IN STRUCTURAL STEEL, INTENDED TO BE USED IN ANCHORS, SHALL BE 1/16TH INCH (1.50 MM) LARGER THAN THE NOMINAL DIAMETER OF THE BOLT EXCEPT WHERE LARGER OR SMALLER HOLES ARE STIPULATED IN THE CONTRACT DRAWINGS. PROVIDE STANDARD PLATE WASHER.

13. LOCK NUTS, DOUBLE NUTS OR THREAD LOCKING COMPOUND SHALL BE USED ON ALL NUTS NOT TENSIONED IN ACCORD WITH THE SPECIFICATIONS FOR A325 OR A490 BOLTS AND NUTS. PROVIDE THREAD LOCKING COMPOUND ON A325 AND A490 BOLTS ONLY WHERE ALLOWED SPECIFICALLY IN THE CONTRACT DRAWINGS. AT OTHER LOCATIONS, USE DOUBLE NUTS OR LOCKING NUTS AS SPECIFIED HEREIN.

14. CLEANING, PAINTING AND GALVANIZING

1. GENERAL: STEEL WORK SHALL BE CLEANED, PAINTED OR GALVANIZED AS PROVIDED HEREIN. BASIC WORK SHALL BE DONE IN THE SHOP, WITH FIELD TOUCH-UP, ONLY, DONE IN THE FIELD.

2. CORROSION PROTECTION: THIS SPECIFICATION CONTemplates 6 LEVELS OF CORROSION PROTECTION:

a) FIREPROOFED/UNPAINTED: STEEL WORK SHALL BE SHOP CLEANED TO KEEP THE SURFACE FREE OF OIL, GREASE, SP, ADDITIONAL CLEANING SHALL BE ACCOMPLISHED IN THE FIELD TO ALLOW PROPER ADHERENCE OF SPRAY FIREPROOFING.

b) FIREPROOFED/PAINTED: PROVIDE AS FOR FIREPROOFED/UNPAINTED, BUT PAINT WITH SHOP PRIMER WITH FIELD TOUCH-UP, NOT LESS THAN 2.0 MIL MORE THAN 4.0 DRY FILM THICKNESS (150 µm/100 µm). PROVIDE ONLY MATERIALS SHOWN SPECIFICALLY IN THE CONTRACT DRAWINGS.

c) SHOP PRIMER: PROVIDE AS FOR FIREPROOFED/SHOP PRIMER.

d) EXPOSED TO AMBIENT TEMPERATURE: STEEL WHICH IS ENCLOSED, CONCRETE-ENCLOSED OR FIREPROOFED, BUT WHICH IS NOT PROTECTED FROM CHANGES IN AMBIENT TEMPERATURE, SHALL BE CLEANED TO MEET THE REQUIREMENTS OF SSPC-SP6 BEFORE PAINTING WITH A STIC-RICH PRIMER WITH FIELD TOUCH-UP, NOT LESS THAN 2.0 MIL MORE THAN 3.5 DRY FILM THICKNESS (50 µm/90 µm).

1) PROVIDE GALVANIZED BOLTS, NUTS, WASHERS, DTI'S AND INSERTS, AS APPLICABLE, FOR THE BOLTING OF MEMBERS EXPOSED TO AMBIENT TEMPERATURES.

1) MEMBERS EXPOSED TO AMBIENT TEMPERATURES SHALL BE FULLY PAINTED. NO-PAINT AREAS ARE NOT PERMITTED.

e) EXPOSED TO WEATHER: STEEL WHICH IS EXPOSED TO THE WEATHER INCLUDING EXTERIOR LINTELS (EXCEPT WHERE STAINLESS IS REQUIRED) SHALL BE NOT-DIPPED GALVANIZED. TOUCH-UP A WELD AND AT DAMAGED SURFACES AFTER FIRST CLEANING TO SSPC-SP1, WITH SLAG AND WELD SPATTER REMOVED FROM ALL AREAS. PAINT GALVANIZED STEEL WHERE SHOWN IN THE CONTRACT DRAWINGS.

1) PROVIDE GALVANIZED BOLTS, NUTS, WASHERS, DTI'S, AND INSERTS, AS APPLICABLE, FOR THE BOLTING OF GALVANIZED MEMBERS.

1. PAINT SHALL BE APPLIED ONLY TO DRY SURFACES, ONLY AT TIMES WHEN STEEL SURFACE TEMPERATURES ARE ABOVE THE DEW POINT, AND SHALL BE APPLIED THOROUGHLY AND EVENLY WITHOUT SACS OR HOLIDAYS. PAINT SHALL BE APPLIED BY SUITABLE SPRAY EQUIPMENT IN STRICT ACCORD WITH THE PAINT MANUFACTURER'S PRINTED INSTRUCTIONS. PROVIDE A DRY FILM THICKNESS WITHIN THE RANGE SPECIFIED HEREIN, INCLUDING AROUND OUTSIDE CORNERS OR OTHER ABRUPT CHANGES IN SURFACE PROFILE.

4. FIELD TOUCH-UP SHALL BE PROVIDED TO FIELD BOLTS OF PAINTED AND OF GALVANIZED CONNECTIONS AND TO ALL POINTS OF DAMAGE, INCLUDING AREAS RECEIVING WELD AFTER COATING.

a) UNPAINTED SURFACES SHALL BE RECLEANED TO THE EXTENT NECESSARY TO ACHIEVE SOUND TIGHT BOND OF OTHER WORK.

d) PAINTED SURFACES SHALL BE CLEANED AND PAINTED TO THE STANDARDS OF THE SHOP COATING AND TOUCH-UP SO AS TO PROVIDE FOR WORKMANLIKE SURFACES AND FOR TIGHT BOND OF OTHER WORK.

e) GALVANIZED SURFACES SHALL BE CLEANED OF SLAG AND BURNED METAL BY VIGOROUS WIRE BRUSHING AND OTHER TOOLS, TO PRODUCE SHINY METAL, FREE FROM LOOSE PARTICLES. FINISH CLEAN BY SOLVENTS IN ACCORD WITH SSPC-SP1. FIELD-APPLY GALVANIZING TOUCH-UP TO ACHIEVE QUALITY OF THE ORIGINAL AND UNPAINTED SHOP COATING.

d) COAT NO-PAINT AREAS AFTER COMPLETION OF ERECTION.

5. CONTACT WITH ALUMINUM: SURFACES WHICH WILL BE IN CONTACT WITH ALUMINUM SHALL RECEIVE TWO COATS OF ALUMINUM PASTE VARNISH OVER A SHOP-PRIMER SURFACE.

**IV. REINFORCED CONCRETE**

A. SEE ARCHITECTURAL DRAWINGS FOR EXACT DETAIL AND LOCATION OF CURBS, OPENINGS OR RECESSES IN SLABS AND FOR OTHER DIMENSIONS NOT SHOWN IN STRUCTURAL DRAWINGS.

SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR INFORMATION REGARDING SIZE AND LOCATION OF OPENINGS FOR DUCTS, PIPES, CONDUITS AND THE LIKE. FOR MACHINE PADS, ETC.

OPENINGS OR RECESSES IN THE STRUCTURE WHICH ARE NOT SHOWN IN THE STRUCTURAL DRAWINGS, EITHER DIRECTLY OR BY TYPICAL DETAIL, SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.

B. NORMAL WEIGHT CONCRETE MIXTURES SHALL BE READY-MIXED CONCRETE 28-DAY COMPRESSIVE STRENGTH,  $f'_c = 4,000$  PSI AND WITH A DRY UNIT WEIGHT OF 145 PCF UNLESS OTHERWISE NOTED. LIGHTWEIGHT CONCRETE MIXTURES SHALL BE READY-MIXED CONCRETE 28-DAY COMPRESSIVE STRENGTH,  $f'_c = 4,000$  PSI. READY-MIXED CONCRETE SHALL BE SUPPLIED BY A NEW YORK CITY CERTIFIED BATCH PLANT.

LIGHTWEIGHT CONCRETE SHALL PROVIDE AN AIR-DRY UNIT WEIGHT OF NOT LESS THAN 110 PCF (1761 KG/CUBIC METR) NOR MORE THAN 115 PCF (1840 KG/CUBIC METR), MEASURED IN ACCORD WITH ASTM C567, AND SHALL HAVE A MAXIMUM FRESH UNIT WEIGHT OF 153 PCF (1870 KG/CUBIC METR). ALL MEASUREMENTS SHALL BE TAKEN AT POINTS OF DISCHARGE INTO THE WORK.

LIGHTWEIGHT COARSE AGGREGATE SHALL BE A ROTARY KILN PRODUCT OF EXPANDED SHALE OR SLATE, CONFORMING TO ASTM/A578 C110, ASTM GRADE SIZE #67 (19 TO 4.8 MM) OR ASTM GRADE SIZE #8 (19.5 TO 2.4 MM).

HAND-MIXED CONCRETE SHALL BE USED ONLY WHERE SPECIFICALLY ACCEPTED BY ENGINEER. SUCH CONCRETE SHALL BE MIXED ONLY IN WATERPROOF CONTAINERS WITH DRY MATERIALS MEASURED BY VOLUME. SAND AND CEMENT MIXED TOGETHER DRY PRIOR TO ADDING COARSE AGGREGATE. WATER, WHEN ADDED, SHALL BE APPLIED SLOWLY WITH THE ENTIRE MASS TURNED TO PROVIDE FOR AN EVEN MIXTURE AT ALL TIMES.

C. UNLESS OTHERWISE NOTED: ALL WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.

D. MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING (SUBJECT TO TOLERANCES PERMITTED BY CODE) IN ACCORDANCE WITH ACI 318, UNLESS OTHERWISE INDICATED.

E. SPLICING OF WWP, AT ALL SPLICE EDGES SHALL BE SUCH THAT THE OVERLAP MEASURED BETWEEN OUTERMOST CROSS WIRES OF EACH FABRIC SHEET IS NOT LESS THAN THE SPACING OF THE CROSS WIRES PLUS 2 INCHES, NOR LESS THAN 6 INCHES.

F. CAST NEW CONCRETE AS REQUIRED TO REPAIR CONCRETE SLABS, BEAM EXPOSURES, AND THE LIKE THAT HAD BEEN DAMAGED OR REMOVED IN THE EXECUTION OF THIS CONTRACT.

1. FILL WITH NON-SHEDDING GROUT ALL ABANDONED SLAB OPENINGS.

G. REINFORCING STEEL DESIGNATED TO REMAIN FOLLOWING THE DEMOLITION AND CONCRETE REMOVAL OPERATIONS SHALL BE REPAIRED IF DAMAGED IN THE COURSE OF THE WORK. SUBMIT REPAIR PROCEDURES FOR ACCEPTANCE BY THE ENGINEER.

H. SPLICING OF REINFORCEMENT IS PERMITTED ONLY AT LOCATIONS SHOWN IN THE CONTRACT DRAWINGS OR AS ACCEPTED BY THE ENGINEER. UNLESS OTHERWISE SHOWN OR NOTED, REINFORCING STEEL SHALL BE SPLICED FOR ITS FULL TENSILE CAPACITY IN ACCORDANCE WITH ACI 318.

I. REINFORCING BAR DEVELOPMENT LENGTHS SHALL BE COMPUTED IN ACCORDANCE WITH ACI 318-89.

J. GROUT UNDER BASE PLATES AND BEARING PLATES SHALL BE NON-SHEDDING TYPE.

K. HORIZONTAL CURVEDS ARE PERMITTED IN SLABS PROVIDED THAT THE SLAB THICKNESS IS AT LEAST 4" THICK. THE CURVED SIZE IS NOT GREATER THAN 1/3 OF THE SLAB THICKNESS (OR 1/6 OF THE SLAB THICKNESS WHERE TWO CURVEDS MEET CROSS), AND THE CURVED IS NOT AT A 90 DEGREE IN THE SLAB THICKNESS AND ARE SPACED NOT LESS THAN THREE CURVED DIAMETERS OR WIDTHS ON CENTER AND CAN BE ACCOMMODATED WITHOUT DISPLACING REINFORCEMENT FROM LOCATIONS PROVIDED IN THE CONTRACT DOCUMENTS. ALUMINUM CURVEDS IS PROHIBITED. CONFORM TO THE REQUIREMENTS OF ACI 318.

**V. METAL DECK**

A. METAL FLOOR DECK ACTS COMPOSITELY WITH THE CONCRETE. PROVIDE GALVANIZED STEEL FLOOR AND ROOF DECK CONFORMING TO ASTM A551 50 GRADE 40, HAVING A MINIMUM YIELD POINT OF 40 KSI. GALVANIZING SHALL CONFORM TO ASTM A524. MINIMUM COATING OF 0.00. FOR INSTALLATION OVER PITS TO BE ENCLOSED UNDER WATERPROOF DECKS AND AT ROOFING LEVELS, USE COATING 0.00 OR HEAVIER. PROVIDE UNITED STEEL DECK, 20 GAGE (MIN), 2" DEEP LIP-FLOOR DECK AND UNITED STEEL DECK, 18 GAGE (MIN), 1 1/2" DEEP TYPE B1 ROOF DECK.

B. SHEET METAL ACCESSORIES: CONFORM TO ASTM A516. COMMERCIAL QUALITY, GALVANIZED.

C. WELDING MATERIALS SHALL CONFORM TO BUILDING CODE AND TO AWS A5.1 OR A5.5, AND SHALL BE E7010 FOR JOINING STEEL DECK TO STRUCTURAL STEEL AND FOR WELDING STEEL DECK SIDE LAPS. E7018 FOR JOINING STEEL PLATES AND SHAPES.

D. SELF-DRILLING FASTENERS FOR DECK SIDE LAPS: #12-14 X 3/4" NON-TENSILE AS MANUFACTURED BY BUILDUP DIVISION OF ILLINOIS TOOL WORKS, ELK GROVE VILLAGE, ILLINOIS, OR OTHER ACCEPTED BY ENGINEER.

E. INSTALL STEEL DECK UNITS AND ACCESSORIES IN ACCORD WITH MANUFACTURER'S RECOMMENDATIONS, ACCEPTED SHOP DRAWINGS, AND AS SPECIFIED HEREIN.

F. CLEANING: PRIOR TO LAYING OUT STEEL DECK UNITS, CONTRACTOR SHALL CLEAN SURFACE OF SUPPORTING STEEL, REMOVING GREASE, OIL, DEBRIS AND OTHER DELETERIOUS FOREIGN MATERIAL WHICH MAY INTERFERE WITH THE CONSISTENT ACHIEVEMENT OF SOUND WELDING OF STEEL SHEAR CONNECTIONS THROUGH STEEL DECK AND OF ARC WELDING OF DECK UNITS TO SUPPORTS.

G. FASTENING: PERMANENTLY FASTEN STEEL DECK UNITS TO SUPPORTING MEMBER BY 0.75 INCH (19 MM) DIAMETER FUSION WELDS AT 12 INCHES (300 MM) MAXIMUM SPACING UNLESS A SMALLER SPACING IS GIVEN IN THE CONTRACT DRAWINGS OR OTHERWISE REQUIRED BY THE PROVISIONS OF THIS SPECIFICATION. WELDS MAY BE OMITTED IN PITS IN WHICH GREAS CONNECTIONS ARE TO BE APPLIED EXCEPT THAT EACH DECK SECTION SHALL HAVE SUFFICIENT WELDS TO ADEQUATELY SECURE THE DECK AND TO BRING THE DECK INTO DIRECT CONTACT WITH THE SUPPORTING STEEL.

H. SIDE LAPS: LOCK SIDE LAPS BETWEEN ADJACENT DECK UNITS BY WELDING WITH 0.75 INCH DIAMETER FUSION WELDS AT INTERVALS NOT EXCEEDING 18 INCHES (450 MM), EXCEPT WHERE COVER SPACING IS REQUIRED TO PREVENT DIFFERENTIAL DEFLECTION OF ADJACENT LAPS UNDER FRESH CONCRETE OR OTHER CONSTRUCTION LOADS.

1. AT CANTILEVER SPANS, SIDE LAP LOCKS SHALL BE PLACED NOT MORE THAN 1 INCHES (25 MM) FROM DECK END AND AT INTERVALS NOT EXCEEDING ONE HALF OF NORMAL SPACING.

I. OPENINGS THROUGH SLAB DECK OR DECK WHICH ARE NOT SHOWN IN THE STRUCTURAL DRAWINGS SHALL BE SUBMITTED TO ENGINEER FOR REVIEW.

**VI. CONTROLLED INSPECTION**

A. CONTROLLED INSPECTION IS REQUIRED PER NYC BUILDING CODE (24-22) FOR ALL STRUCTURAL STEEL WELDING, HIGH STRENGTH BOLTING, INSTALLATION OF CONCRETE REINFORCING STEEL AND CONCRETE PLACEMENT OPERATIONS.

